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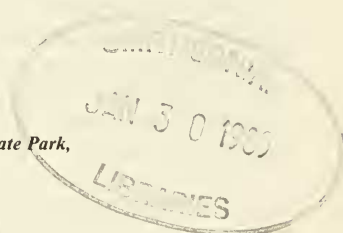
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THREE NEW SPECIES OF *HOLOGRAPHIS* (ACANTHACEAE)
FROM MEXICO

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ABSTRACT: Three new species of *Holographis*, *H. caput-medusae*, *H. leticiana*, and *H. tolantongensis*, are described from Mexico. Diagnostic features of each species are illustrated and the known distribution of the three species is mapped. A revised key to the entire genus, incorporating data and species that have become known since the last monograph of *Holographis*, is presented. Fifteen species are now known for this entirely Mexican genus.

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INTRODUCTION

Holographis Nees is a small genus of perennial herbs and shrubs endemic to Mexico. Since my monograph of the genus (Daniel 1983), in which 10 species were recognized, one species (*H. peloria*) has been transferred into *Holographis* from *Stenandrium* Nees (Daniel 1984) and an additional species (*H. websteri*) has been newly described (Daniel 1986). Continued botanical exploration in the dry forests of Mexico has revealed the existence of three undescribed and distinctive species, bringing the total number of species now known for the genus to 15. These three new species are described below.

Because of the increased botanical activity in Mexico in recent years, a significant number of

additional collections of previously recognized species of *Holographis* has become available. Some species (e.g., *H. argyrea*, *H. anisophylla*, and *H. parayana*) are now known from twice as many or more collections than they were in 1983. Fruiting collections have been located for four species (*H. argyrea*, *H. anisophylla*, *H. peloria*, and *H. pueblensis*) whose capsules and seeds were previously undescribed. The known geographic distributions of several species (e.g., *H. anisophylla* and *H. peloria*) have been increased. A key to all species of the genus is presented below that includes the five taxa recognized in *Holographis* since the monograph of 1983 and that incorporates information from other species based on additional collections examined.

KEY TO THE SPECIES OF *HOLOGRAPHIS*

1. Leaves opposite (rarely subopposite).
2. Corolla yellow with maroon markings, vertical during anthesis, the upper lip 1-2.5 mm long; stamens 1.5 mm long with thecae 1-1.3 mm long; style 4 mm long; Balsas basin in Guerrero. *H. argyrea*

2. Corolla white or pinkish, horizontal during anthesis, the upper lip 2.5–5 mm long; stamens 2.8–5.5 mm long with thecae 1.5–2.5 mm long; style 5–7.5 mm long; plants occurring to the north of Guerrero.
3. Abaxial surface of bracts, bractlets, and calyx glabrous; calyx 4–5 mm long; corolla white; Tamaulipas. *H. tamaulipica*
3. Abaxial surface of bracts, bractlets, and calyx pubescent; calyx 5–10 mm long; corolla pinkish; plants occurring to the south and west of Tamaulipas.
4. Corolla glabrous on external surface; calyx lobes aristate at apex; staminode 2 mm long; Hidalgo. *H. tolantongensis*
4. Corolla pubescent on external surface; calyx lobes acute at apex; staminode 0.5–0.8 mm long; Sonoran Desert region. *H. virgata*
1. Leaves whorled, four per node (lower leaves of *H. pueblensis* sometimes opposite to subopposite; rarely opposite on some, but not all, shoots of individuals of *H. ehrenbergiana*).
5. Leaves orbicular, 0.8–1.3 times longer than wide, the margin spinose toothed; bracts alternate; Chihuahuan Desert region. *H. ilicifolia*
5. Leaves lanceolate to ovate to elliptic to obovate to oblanceolate, 1.5–6 times longer than wide, margin entire to undulate; bracts opposite; plants occurring outside of the Chihuahuan Desert region.
6. Corolla yellow, the upper lip 6–9 mm long; stamens 9–11 mm long; seeds glabrous.
7. Inflorescence to 4.5 cm long, many-flowered; bracts 5–11 mm long, 1.5–2 mm wide; calyx 7–10.5 mm long. *H. pueblensis*
7. Inflorescence to 2 cm long, usually reduced to 2 flowers; bracts 1.5–5 mm long, 0.5–1 mm wide; calyx 3.5–6.5 mm long. *H. ehrenbergiana*
6. Corolla white, pinkish, or reddish (color unknown in *H. hintonii*), the upper lip 1.5–5.5 mm long; stamens 1.2–6.5 mm long; seeds pubescent or with hairlike papillae (glabrous in *H. peloria*).
8. Leaves up to 13 mm long; corolla 6.5–7.5 mm long, the lower lip 2.5–3.5 mm long; stamens 1.2 mm long with thecae 1 mm long; style 1.8–2.5 mm long; Yucatán Peninsula. *H. websteri*
8. Leaves up to 105 mm long; corolla 8–17 mm long, the lower lip 4–9 mm long; stamens 2.5–6.5 mm long with thecae 1.2–2.6 mm long; style 3.5–9.5 mm long; plants occurring to the west of the Yucatán Peninsula.
9. Bracts 6–13 mm long; bractlets 6–10.5 mm long; corolla pubescent with eglandular trichomes on external surface; seeds glabrous, covered with stout papillae or tubercles.
10. Cauline trichomes to 0.1 mm long; bracts lanceolate, 0.8–1.2 mm wide, long-attenuate and recurved at apex; bractlets and calyx lobes recurved; capsule puberulent; Guerrero. *H. caput-medusae*
10. Cauline trichomes 0.1–1 mm long; bracts ovate-elliptic to obovate, 2.8–5 mm wide, rounded to acute and erect at apex; bractlets and calyx lobes erect; capsule glabrous; Durango and Zacatecas. *H. peloria*
9. Bracts 1.5–6 mm long; bractlets 1.5–4 mm long; corolla pubescent with glandular (sometimes absent in *H. parayana* and *H. pallida*) and eglandular trichomes on external surface; seeds pubescent with dendroid trichomes.
11. Inflorescence axis pubescent with crooked, interwoven, eglandular trichomes obscuring the axis; bracts broadly ovate to orbicular, 1.5–2 mm long. *H. hintonii*
11. Inflorescence axis pubescent with straight to ascendent to recurved to flexuose, eglandular (and often glandular) trichomes, these neither crooked, interwoven, nor obscuring the axis; bracts triangular to subulate to lanceolate to ovate, 2–6 mm long.
12. Bracts attenuate to a point but lacking a distinct mucro at apex; upper

lip of corolla 3–5.5 mm long; staminode 0.6–1.2 mm long; capsule 11–17 mm long.

13. Cauline trichomes ascendent-appressed, 0.1–0.5 mm long; corolla horizontal during anthesis; stamens 3–3.2 mm long with thecae 1.2–1.5 mm long; style 5–6 mm long; seeds 2.5–3 mm long; Chiapas.

..... *H. parayana*

13. Cauline trichomes retrorse, 0.05–0.2 mm long; corolla more or less vertical during anthesis; stamens 5.5–6.5 mm long with thecae 2–2.6 mm long; style 7–9.5 mm long; seeds 4.5–5.5 mm long; Oaxaca.

..... *H. leticiiana*

12. Bracts mucronate at apex; upper lip of corolla 1.5–3 mm long; staminode 0.1–0.3 mm long; capsule 7–9 mm long.

14. Bractlets 1–1.5 mm wide; corolla 8–10 mm long, the upper lip 1.5–2 mm long; stamens 2.5–3 mm long; style 3.5–4.5 mm long; capsule glabrous; Jalisco and Colima.

..... *H. anisophylla*

14. Bractlets 0.8–1 mm wide; corolla 10–12 mm long, the upper lip 2–3 mm long; stamens 3.5–4 mm long; style 5.3–6 mm long; capsule pubescent; Sonora and Sinaloa.

..... *H. pallida*

***HologrAPHIS tolantongensis* T. F. Daniel, sp. nov.**
(Figures 1, 2)

TYPE.—MEXICO, Hidalgo: Mpio. Cardonal, Barranca de Tolantongo, lado oeste, 45 km NE of Ixmiquilpan, 10 February 1982, R. Hernández M. y P. Tenorio L. 6948 (Holotype: MEXU!; isotype: CAS!).

Suffrutex usque ad 6 dm altus. Caules juniores pubescentes trichomatibus eglandulosis 0.05–0.7 mm longis. Folia opposita petiolata, lamina lanceolata vel ovata vel elliptica 13–32 mm longa 3.5–14 mm lata 2.3–4.7-plo longior quam latior margine revoluta. Inflorescentia spicata, bracteae lanceolatae 6.5–9 mm longae 1.5–2.5 mm latae apice acuminatae erectae, bracteolae lancisubulatae 5.5–7 mm longae 1–1.5 mm latae apice subaristatae erectae. Calyx 7.5–10 mm longus, corolla rosea-purpurea 12–13 mm longa extus glabra, stamina 4.5 mm longa, stylus 7–7.5 mm longus. Capsula ignota.

Subshrub to 6 dm tall. Young stems evenly pubescent with understory of straight to antrorse, eglandular trichomes 0.05–0.2 mm long and sparse overstory of straight to flexuose, eglandular trichomes 0.3–0.7 mm long. Leaves opposite, petiolate, petioles 2–6 mm long, blades coriaceous, lanceolate to ovate to elliptic, 13–32 mm long, 3.5–14 mm wide, 2.3–4.7 times longer than wide, acute at apex, acute at base, adaxial surface dark green, evenly pubescent with flexuose to antrorse-flexuose trichomes to 1 mm long (strigose), abaxial surface light green, pubescent along veins and glabrous or nearly so in inter-

costal regions, margin revolute. Inflorescence of terminal spikes to 3.5 cm long, flowers opposite at nodes, rachis strigose. Bracts lanceolate, 6.5–9 mm long, 1.5–2.5 mm wide, acuminate and erect at apex, abaxial surface strigose. Bractlets lance-subulate, 5.5–7 mm long, 1–1.5 mm wide, shorter than bracts, subaristate and erect at apex, margin often hyaline. Calyx 7.5–10 mm long, lobes narrowly lanceolate to lance-subulate, unequal in length and overlapping one another, sparsely strigose distally, aristate and erect at apex, margins often hyaline. Corolla pinkish-purple, somewhat intermediate between vertical and horizontal during anthesis, 12–13 mm long, glabrous on external surface, tube 7–7.5 mm long, upper lip 4–4.5 mm long with lobes 2–2.5 mm long, lower lip 6–7 mm long with obovate lobes 5–6 mm long. Stamens 4.5 mm long, filaments pubescent, thecae 1.4–1.5 mm long, pollen (observed in Diaphane) prolate, 32–39 μ m long (polar diameter), 25–27 μ m wide (equatorial diameter), 1.3–1.6 times longer than wide, colpi indistinct; staminode 2 mm long, pubescent at apex. Style 7–7.5 mm long, glabrous; stigma asymmetric, 0.2 mm long; ovary glabrous. Capsule unknown.

DISTRIBUTION AND PHENOLOGY.—Known only from the Barranca de Tolantongo in central Hidalgo, Mexico (Fig. 3). The plants occur abundantly in rocky soil with *Pinus pinceana* Gordon, *Quercus opaca* Trel., *Gochnatia hypoleuca* (DC.) A. Gray, and *Juniperus* L. at an elevation of about 2,000 m. Flowering: February.



FIGURE 1. *Holographis tolantongensis* (Hernández M. y Tenorio L. 6948). a, Habit, $\times 0.5$; b, Leaf and section of stem, $\times 3.3$; c, Portion of inflorescence, $\times 3.5$; d, Corolla cut open to show androecium, $\times 3.5$; e, Style, $\times 4.6$.

Holographis tolantongensis exhibits the following unique combination of characters: opposite leaves, bracts with the abaxial surface pubescent, pinkish-purple corollas with the external surface glabrous, and calyces 7.5–10 mm long. The only other species of *Holographis* known from Hidalgo, *H. ehrenbergiana*, has mostly whorled leaves and yellow corollas.

***Holographis caput-medusae* T. F. Daniel, sp. nov.**
(Figures 2, 4)

TYPE.—MEXICO. Guerrero: along road from Petatlán to Camalotito, 9.8 km SW of Camalotito, 8 March 1987, T. F. Daniel and B. Bartholomew 4918 (Holotype: CAS!; isotypes: K!, MEXU!, MICH!, NY!, US!).

Herba perennis usque ad 4 dm alta. Caules juniores pubescentes trichomatibus inconspicuis

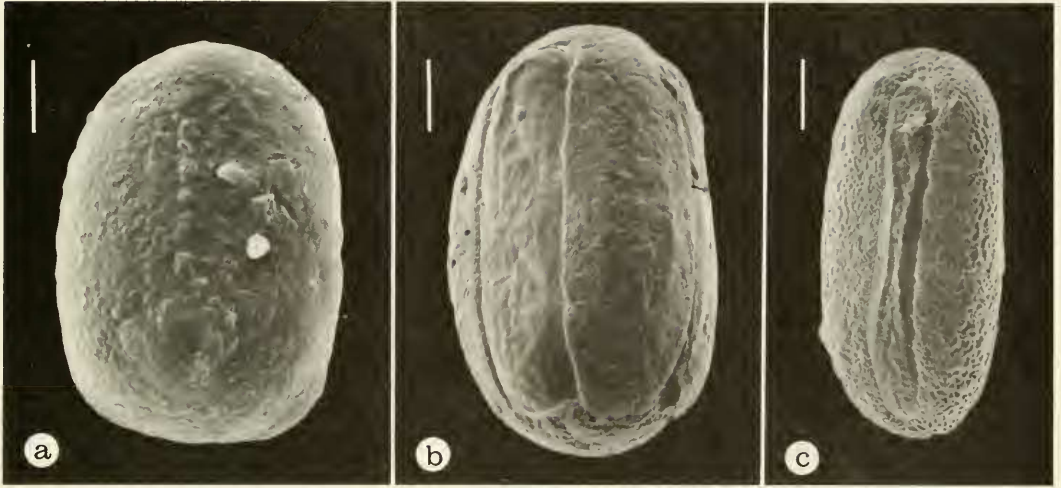


FIGURE 2. Scanning electron micrographs of pollen of *Holographis*. a, *H. tolantongensis* (Hernández M. and Tenorio L. 6948), scale equals 6 μ m; b, *H. caput-medusae* (Daniel and Bartholomew 4918), scale equals 6 μ m; c, *Holographis leticiiana* (Torres C. et al. 637), scale equals 7.5 μ m.

retrorsi eglandulosi usque ad 0.1 mm longis. Folia verticillata in quoque nodo quatuor sessilia vel subsessilia, lamina anguste elliptica vel elliptica vel ovato-elliptica vel obovato-elliptica 30–97 mm longa 10–40 mm lata 2.1–6-plo longior quam latior margine plana. Inflorescentia spicata, bracteae lanceolatae 6–8 mm longae 0.8–1.2 mm latae apice longiattenuatae recurvatae, bracteolae lanceolatae 6–8 mm longae 0.5–1 mm latae apice longiattenuatae recurvatae. Calyx 8.5–10 mm longus, corolla albida et rosea 11–14 mm

longa extus pubescens, stamina 3.5 mm longa, stylus 6.5–7.5 mm longus. Capsula 8–9 mm longa puberula. Semina 2.2–3 mm longa, 1.8–2 mm lata.

Perennial herb to 4 dm tall. Young stems inconspicuously pubescent with retrorse, eglandular trichomes up to 0.1 mm long concentrated in two vertical lines to glabrous. Leaves whorled (four/node), sessile to subsessile, petioles (if present) up to 1 mm long, blades chartaceous, narrowly elliptic to elliptic to ovate-elliptic to ob-

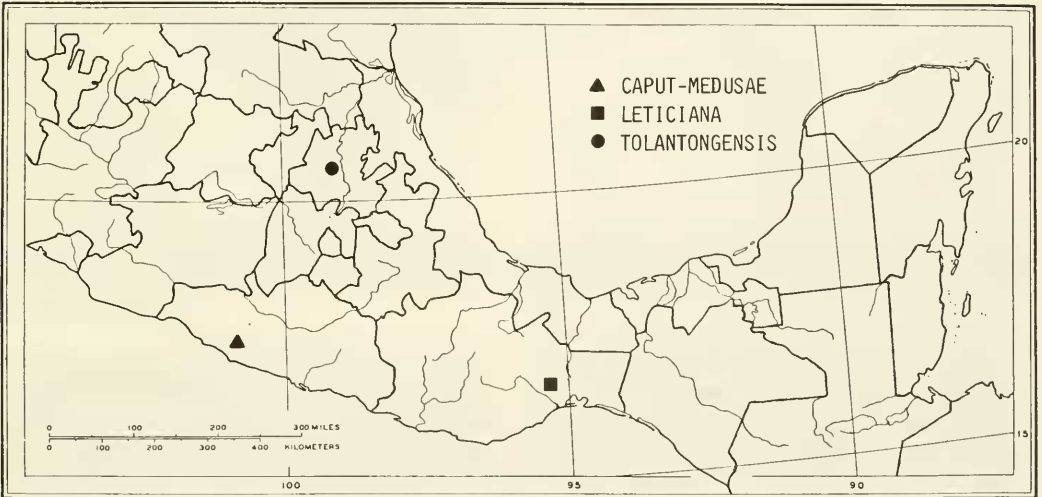


FIGURE 3. Map showing distribution of *Holographis caput-medusae*, *H. leticiiana*, and *H. tolantongensis*.

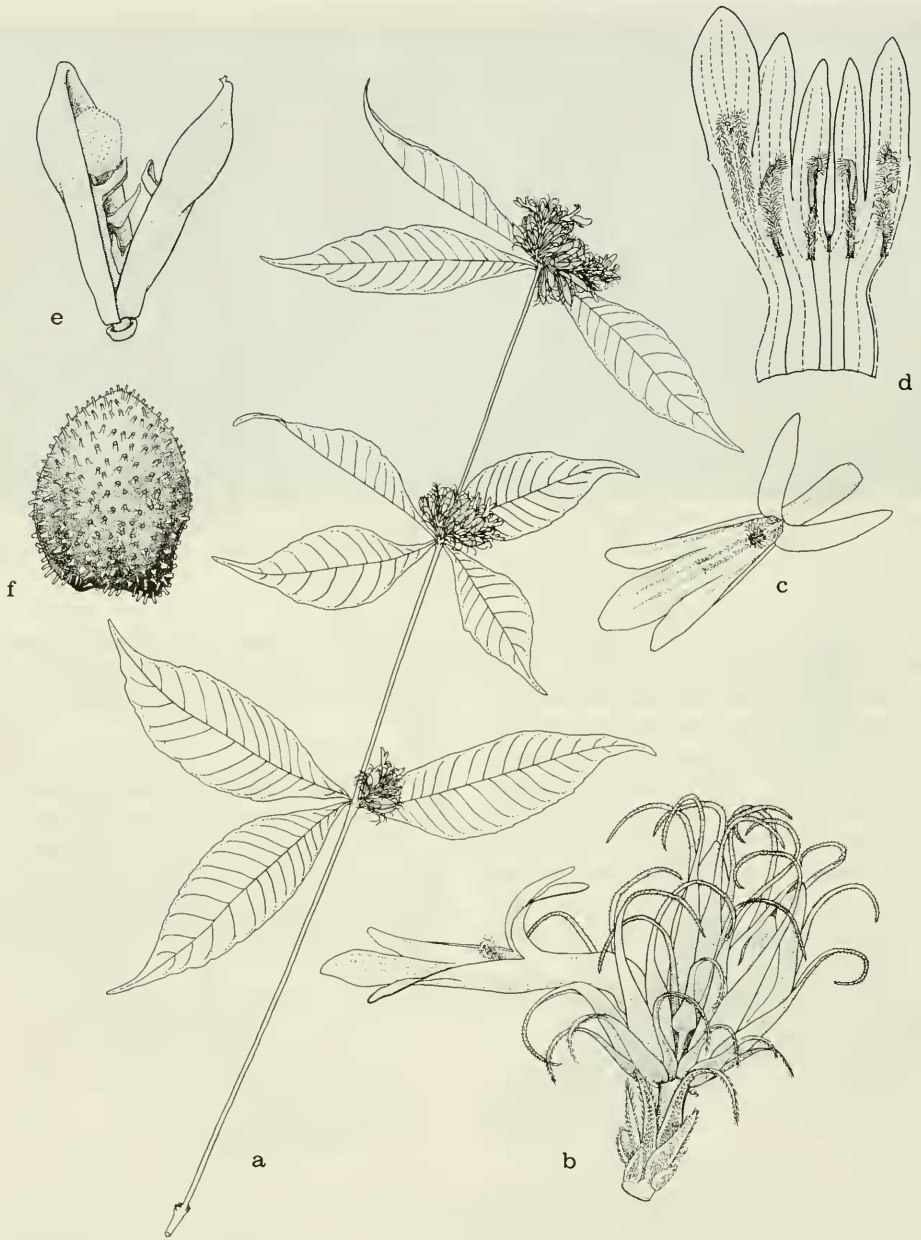


FIGURE 4. *Holographis capit-medusae* (Daniel and Bartholomew 4918). a, Habit, $\times 0.5$; b, Inflorescence, $\times 3.4$; c, Corolla, $\times 3.6$; d, Corolla cut open to show androecium, $\times 4.3$; e, Capsule, $\times 4$; f, Seed, $\times 11.5$.

ovate-elliptic, 30–97 mm long, 10–40 mm wide, 2.1–6 times longer than wide, acuminate at apex, attenuate nearly to or to the node at base, adaxial surface sparsely pubescent with coarse, antrorse, eglandular trichomes 0.2–0.5 mm long, abaxial surface glabrous or nearly so, margin entire to somewhat undulate, flat. Inflorescence of axillary

spikes to 3 cm long, flowers opposite at nodes, rachis evenly and densely pubescent with straight, eglandular trichomes to 0.05 mm long. Bracts lanceolate, 6–8 mm long, 0.8–1.2 mm wide, abaxial surface pubescent like rachis, apex long-attenuate and recurved. Bractlets lanceolate, 6–8 mm long, 0.5–1 mm wide, approximately equal

in length to bracts, pubescent like bracts, apex long-attenuate and recurved. Calyx 8.5–10 mm long, lobes equal in length and slightly overlapping one another, pubescent like bracts, long-attenuate and recurved at apex, margin hyaline proximally. Corolla whitish with pink lines on lower lip, horizontal during anthesis, 11–14 mm long, pubescent on external surface with eglandular trichomes 0.05–0.1 mm long, tube 5–7 mm long, upper lip 4.5–5.5 mm long with linear-elliptic lobes 4.5–5.5 mm long, lower lip 6–7 mm long with elliptic to obovate lobes 3–4.7 mm long. Stamens 3.5 mm long, filaments pubescent, thecae 1.3–1.6 mm long, pollen (observed in *Diaphane*) prolate, 34–42 μ m long (polar diameter), 25–27 μ m wide (equatorial diameter), 1.4–1.6 times longer than wide, colpi distinct; staminode 0.6 mm long, pubescent at apex. Style 6.5–7.5 mm long, sparsely pubescent; stigma unequally bilobed, 0.2–0.3 mm long. Capsule 8–9 mm long, puberulent with trichomes less than 0.05 mm long. Seeds subelliptical to subrectangular in outline, 2.2–3 mm long, 1.8–2 mm wide, surfaces covered with hairlike papillae to 0.1 mm long.

DISTRIBUTION AND PHENOLOGY.—Known only from the seaward slopes of the Sierra Madre Sur in western Guerrero (Fig. 3) in a region of tropical dry forest at an elevation of approximately 150 m. Flowering and fruiting: March.

Holographis caput-medusae is unique in the genus by virtue of its relatively long, attenuate-recurved bracts, bractlets, and calyx lobes. These give the dense spikes a medusoid appearance. *Holographis caput-medusae* is the third species of the genus to be found in Guerrero. Unlike the other two, *H. argyrea* and *H. hintonii*, it occurs in the Pacific lowlands. The holotype was collected in a weedy thicket rich in Acanthaceae, including: *Aphelandra scabra* (Vahl) Smith, *Carlwrightia arizonica* A. Gray, *Dicliptera resupinata* (Vahl) Juss., *Elytraria imbricata* (Vahl) Pers., *Henrya insularis* Nees, *Odontonema auriculatum* (Rose) T. Daniel, *Ruellia albiflora* Fernald, *Tetramerium nervosum* Nees, and *Tetramerium tenuissimum* Rose.

***Holographis leticiana* T. F. Daniel, sp. nov.**

(Figures 2, 5)

TYPE.—MEXICO. Oaxaca: Distr. Tehuantepec, subida al Cerro Guiengola por la ladera S donde está la fábrica de cal, 25 October 1986, M. Leticia Torres C., R. Torres C., y C. Martínez 637 (Holotype: MEXU!; isotypes: CAS!, and others to be distributed).

Frutex usque ad 1 m altus. Caules juniores puberuli trichomatibus eglandulosis 0.05–0.2 mm longis. Folia verticillata in quoque nodo quatuor petiolata, lamina ovata vel ovato-elliptica 17–82 mm longa 9–27 mm lata 1.5–3-plo longior quam latior margine plana. Inflorescentia spicata, bractae lanceolatae vel lanci-subulatae 2.5–4 mm longae 0.9–1.1 mm latae apice attenuatae erectae, bracteolae subulatae 2.3–3.5 mm longae 0.5–0.7 mm latae apice attenuatae erectae. Calyx 4–5 mm longus, corolla rosea 9.5–14.5 mm longa extus pubescens, staminia 5.5–6.5 mm longa, stylus 7–9.5 mm longus. Capsula 11–17 mm longa glabra. Semina 5–5.5 mm longa, 3.8–4.5 mm lata.

Shrub to 2 m tall. Young stems evenly puberulent with retrorse, eglandular trichomes 0.05–0.2 mm long. Leaves whorled (four/node), petiolate, petioles 2–17 mm long, blades chartaceous, ovate to ovate-elliptic, 6–90 mm long, 4–42 mm wide, 1.5–3 times longer than wide, acute to acuminate at apex, acute to attenuate at base, surfaces pubescent with straight to subflexuose to antrorse, eglandular trichomes to 0.2 mm long, margin entire to subundulate, flat. Inflorescence of axillary spikes to 2.5 cm long, flowers opposite at nodes, rachis evenly and densely pubescent with erect to downward pointing, eglandular trichomes 0.1–0.2 mm long. Bracts lanceolate to lance-subulate, 2–4 mm long, 0.9–1.1 mm wide, abaxial surface pubescent with erect to subflexuose or downward pointing, eglandular trichomes to 0.2 mm long, apex attenuate, erect. Bractlets subulate, 2–3.5 mm long, 0.5–0.7 mm wide, shorter than or equal to bracts, pubescent like bracts, apex attenuate, erect. Calyx 3–5 mm long, lobes equal in length and slightly overlapping one another, lanceolate, pubescent like bracts, attenuate and erect at apex. Corolla greenish-white with pinkish or maroon stripes on lower lip, more or less vertical during anthesis, 9.5–14.5 mm long, pubescent on external surface with glandular and eglandular trichomes 0.05–0.2 mm long, tube 2.5–5 mm long, abruptly expanded into a throat 2.5–3.5 mm long, upper lip 3–5.5 mm long with triangular lobes 1–1.5 mm long, lower lip 4.5–7 mm long with obovate lobes 2.5–5 mm long. Stamens 5.5–6.5 mm long, filaments pubescent, thecae 2–2.6 mm long, pollen (observed in *Diaphane*) prolate, 32–39 μ m long (polar diameter), 22–25 μ m wide (equatorial diameter), 1.3–1.8 times longer than wide, colpi distinct; staminode 0.7–1.2 mm long, sparsely



FIGURE 5. *Holograsis leticiiana*. a, Habit (Daniel 5386), $\times 0.5$; b, Inflorescence (Daniel 5386), $\times 4$; c, Corolla cut open to show androecium (Torres C. 637), $\times 4$; d, Distal portion of style and stigma (Daniel 5386), $\times 16$; e, Capsule (Torres C. 773), $\times 3.4$; f, Seed (Torres C. 773), $\times 8$; g, Seminal trichome (Torres C. 773), $\times 42$.

pubescent at apex. Style 7–9.5 mm long, very sparsely pubescent to glabrous; stigma indistinctly bilobed, 0.1 mm long. Capsule 11–18 mm long, glabrous. Seeds subrectangular to subelliptical in outline, 4.5–5.5 mm long, 3.5–4.5 mm

wide, surfaces covered with golden to brown, dendritic trichomes to 0.4 mm long.

DISTRIBUTION AND PHENOLOGY.—Known only from the vicinity of the Cerro Guiengola in southeastern Oaxaca (Fig. 3), where the plants

occur in tropical deciduous forest dominated by legumes and cereoid cacti at elevations from 60 to 600 m. Flowering and fruiting: October–March.

Holographis leticiana can be distinguished from all other species in the genus by the following combination of characters: whorled leaves, pinkish corollas, and stamens 5.5–6.5 mm long. It is most similar to *H. parayana*, a species occurring approximately 200 km to the east in Chiapas. The contrasting features of these two species are summarized in the key above. Plants of this species collected in November 1987 (*Daniel 5386*) were locally common understory shrubs. Flowers were visited by both bombyliid flies and megachilid bees. However, pollen similar to that of *Holographis* was not located on individuals of either. Other Acanthaceae growing with *H. leticiana* include *Tetramerium oaxacanum* T. Daniel and species of *Ruellia* L. and *Siphonoglossa* Oersted.

PARATYPES.—MEXICO. Oaxaca: along road to Ruinas Guiengola, 1.3–1.6 km N of Mex. 190 between Jalapa de Marques and Tehuantepec, *T. Daniel 5386* (CAS, DUKE, F, GH, K, MICH, MEXU, MO, NY, TEX, US); 61.8 km NW of Tehuantepec, *P. Fryxell and E. Lott 3403* (CAS); Distr. Tehuantepec, Ruinas del Cerro Guiengola, *M. L. Torres C. et al. 511* (CAS, MEXU); Distr. Tehuantepec, ladera S del Cerro Guiengola por la fábrica de cal, *M. L. Torres C. et al. 773* (CAS, MEXU); Distr. Tehuantepec, hacia el N a 300 m del

“Mango,” por la subida al Ocotil Cerro Guiengola, *M. L. Torres C. et al. 834* (CAS, MEXU).

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